

WHAT IS CLAIMED IS:

1. A method for using transcranial magnetic stimulation to enhance cognitive performance, comprising the steps of:
 - locating at least one neural circuit in the brain of a subject, which is activated when the person performs a predetermined task;
 - positioning an electromagnetic coil over a region on the scalp of the subject corresponding to the at least one neural circuit in the brain of the subject; and
 - delivering a transcranial magnetic stimulation from the coil to the region on the scalp of the person to induce current to flow in the brain that causes neuronal depolarization in the brain and effectuates a change in the performance of the predetermined task by the subject.
2. The method of claim 1, wherein the subject is a human being.
3. A method for using transcranial magnetic stimulation to enhance cognitive performance in a plurality of subjects, comprising the steps of:
 - dividing the plurality of subjects into groups,
 - subjecting each of the groups into a first state and a second state,
 - locating at least one neural circuit in the brain of a subject in the group corresponding to one of the first state and the second state, which is activated when the subject performs a predetermined task under one of the first state and the second state,
 - positioning an electromagnetic coil over a region on the scalp of the subject corresponding to the at least one neural circuit in the brain of the subject, and
 - delivering a transcranial magnetic stimulation from the coil to the region on the scalp of the subject to induce a current to flow in the brain that causes neuronal depolarization in the brain and effectuates a change in the performance of the predetermined task by the subject under one of the first state and the second state.

4. The method of claim 3, wherein the subjects are human beings.
5. The method of claim 3, wherein the first state is a state in which a subject is at rest, and the second state is a state in which a subject is sleep-deprived.
6. The method of claim 3, wherein functional magnetic resonance imaging maps are used to identify different neural circuits associated with different subject on a state, wherein the neural circuits are activated while a predetermined task is performed.
7. The method of claim 6, wherein transcranial magnetic stimulation is delivered to proper neural circuits to restore and/or retrain the circuits to enhance the performance.
8. A method of using transcranial magnetic stimulation to enhance cognitive performance in at least one subject, comprising:
 - during a behavior individualized imaging of at least one cognitive neural circuit, locating the at least one cognitive neural circuit, individually positioning an electromagnetic coil over a region on the scalp of the subject corresponding to the at least one cognitive neural circuit, and delivering a stimulation through the electromagnetic coil to the at least one cognitive neural circuit to affect the behavior related to the at least one cognitive neural circuit.
9. The method of claim 8, wherein individualized imaging can be performed by a functional magnetic resonance imaging scanner.
10. The method of claim 8, wherein the electromagnetic coil is interleaved with a transcranial magnetic stimulation system to provide synergistic stimulation(s).
11. A system for using transcranial magnetic stimulation to enhance cognitive

performance in at least one subject, comprising:

means for locating at least one neural circuit in the brain of a subject, which is activated when the subject performs a predetermined task,

an electromagnetic coil that can be positioned over a spot on the scalp of the subject corresponding to the at least one neural circuit in the brain of the subject, and

means for delivering a transcranial magnetic stimulation from the coil to the spot on the scalp of the subject so as to induce a current to flow in the brain, cause neuronal depolarization in the brain, and effectuate a change in the performance of the predetermined task by the subject.

12. The system of claim 11, wherein the locating means includes a functional magnetic resonance imaging system that can be utilized to scan and generate maps of the interested neural circuits so as to locate proper neural circuits responsible for a predetermined task.

13. The system of claim 11, further comprising a computer having a CPU and one or more memory devices to coordinate the operation among the different parts of the system, optimize the operation parameters, and facilitate the transcranial magnetic stimulation delivering.

14. The system of claim 13, wherein the operation parameters are transcranial magnetic stimulation parameters.

15. A portable system for using transcranial magnetic stimulation to enhance cognitive performance in at least one subject, the system comprising:

a CPU;

an energy source electrically coupled to the CPU;

a database in communication with the CPU and having functional magnetic resonance imaging (fMRI) maps of neural circuits corresponding to a plurality of tasks

stored therein; and

a movable electromagnetic coil electrically coupled to the energy source and in communication with the CPU, wherein when a subject is to perform a predetermined task, the CPU selects one or more fMRI maps of one or more neural circuits from the corresponding to the predetermined task from the database and causes the movable electromagnetic coil to be positioned over a region on the scalp of the subject according to the selected one or more fMRI maps, and the movable electromagnetic coil delivers transcranial magnetic stimulation to the region on the scalp of the subject so as to induce a current to flow in the brain, cause neuronal depolarization in the brain, and effectuate a change in the performance of the predetermined task by the subject.

16. The system of claim 15, wherein the energy source is a battery..
17. The system of claim 15, wherein the database is associated with a memory device of the CPU and/or a separate memory device.
18. The system of claim 15, wherein the subject is a person.
19. The system of claim 15, wherein the subject is an animal.
20. The system of claim 15, wherein the system is constructed within a frame that is portable.
21. The system of claim 15, wherein the system comprises an array of transcranial magnetic stimulation coils, each being able to deliver transcranial magnetic stimulation individually or in coordination.